



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/893,588	06/29/2001	Takashi Kumamoto	219.40240X00	5620

20457 7590 08/01/2003

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-9889

EXAMINER

CHAMBLISS, ALONZO

ART UNIT	PAPER NUMBER
----------	--------------

2827

DATE MAILED: 08/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/893,588	Applicant(s) KUMAMOTO, TAKASHI	
	Examiner Alonzo Chambliss	Art Unit 2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) 1,2,11,12,23 and 24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3-10, 13-22, and 25-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Amendment A filed 4/10/03 has been fully considered and made of record in Paper No. 5. Therefore, claims 1, 2, 11, 12, 23, and 24 have been cancelled.

Response to Arguments

2. Applicant's arguments filed 4/10/03 in Paper No. 5 have been fully considered but they are not persuasive.

Applicant alleges that the usage of "predetermined" does not render the noted claims 6, 17, and 29 vague and indefinite. This argument is respectfully deemed to be unpersuasive because the usage of "predetermined" does make the claim vague and indefinite, since it is not clear from the claim what the thickness of the under-fill layer is. Furthermore, by applicant using the language "predetermined" applicant has an idea from his invention what that thickness (i.e. the specific range of thickness) of the under-fill layer should be. Thus, for example the usage of predetermined is vague because one can view a range from .1 to 100,000 (mm, micrometers, cm, meters, etc.). Therefore, the 112 2nd rejection is valid.

Applicant alleges that neither Saitoh nor Grigg et al references disclose or suggest applicant's flexible conforming layer. This argument is respectfully deemed to be unpersuasive because Grigg discloses the support layer comprising an adhesive protection tape including a flexible conforming layer applied to the under-fill layer 30 (see page 8 paragraphs 63-65).

Applicant alleges that Saitoh and Grigg are incompatible references since Saitoh teaches adhering adhesive tape to flux provided as an encasing protective layer, and after grinding, performing flux washing to remove the flux. In contrast Grigg et al. teaches uses a "mold compound". Hence, Saitoh appears to apply to a manufacturing step preceding any underfill or "mold compound" step. Thus, the combination of Saitoh and Grigg et al. at least has redundant encasing operations and it would be negative incentive to combine the teachings of such references. This argument is respectfully deemed to be unpersuasive because both Saitoh and Grigg utilize a protective film (i.e. mold compound) in a back grinding process of a die. Thus, the references are compatible based on the fact that similar elements are used in a back grinding process of a die. Grigg states that mold compound 30 renders the dicing tape used in conventional DBG processes (i.e. as taught by Saitoh) unnecessary. However, one can use a dicing tape with the process step of Saitoh, since the dicing tape will not affect the final product and would actually because mold compounds have a relatively high shrinkage rate as evident by Grigg (see paragraph 63).

Applicant alleges that Grigg fails to recognize that any excess under-fill layer rising above the bump structures could later advantageously be squeezed out during mounting so as to underfill areas between opposing lands (of the other substrate). Thus, it is a disadvantage over Applicant's invention in requiring additional manufacturing steps. This argument is deemed unpersuasive since the claims are not so limited in scope.

Therefore, the non-final rejection is maintained and this office action is made **final**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-10, 13-22, and 25-34, insofar as definite, are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh (U.S. 6,060,373) in view of Grigg et al. (U.S. 200210068453).

With respect to Claims 3, 13, and 25, Saitoh discloses a back, grind/mounting arrangement comprising bumped die 11 with a planarizing support layer 13 provided on a bumped surface of the bumped die 11. The support layer 13 comprises a pre-back-grind underfill layer 18 both to provide substantially planar back-grind wafer support during any back grind process (see col. 1 lines 5-19, col. 2 lines 50-67, and col. 3 lines 1-30; Figs. 1 a-1 j, 2a-2d, and 2n-2p). Saitoh does not explicitly disclose using the preback grind underfill layer to provide underfill material during any mounting/under-fill process and an adhesive protection tape including a flexible conforming layer applied to the under-fill layer, wherein the conforming layer covers the remainder portion of the bump-bodies not covered by the under-fill layer of bumps on the bumped surface to further improve a planarity of the support layer. However, Grigg discloses a pre-back

Art Unit: 2827

grind underfill layer 30 to provide underfill material during any mounting/under-fill process. The pre-back grind underfill layer is utilized in the back-grinding process of the wafer (see page 7, paragraph 63-65; Figs. 5 and 6). Grigg further discloses a support layer comprising an adhesive protection tape including a flexible conforming layer applied to the under-fill layer 30. The conforming layer covers the reminder portion of the bump-bodies not covered by the under-fill layer 30 of bumps 18 on the bumped surface to further improve a planarity of the support layer (see page 8, paragraph 65). Thus, Saitoh and Grigg have substantially the same environment of a mold compound for aiding in the back grinding of a die. Therefore, it would have been obvious to incorporate the underfill layer with the device of Saitoh, since the pre-back grind underfill layer would aid in the back grinding process of the wafer and to absorb the inherent physical and thermal stress resulting from differing expansion rates of an integrated circuit semiconductor die and its interconnecting substrate as taught by Grigg.

With respect to Claims 4, 15, and 27, Saitoh discloses the under-fill layer 18 covering an entirety of bump-bodies of bumps 17 on the bumped surface (see Fig. 1f).

With respect to Claim 5, 16, and 28, Saitoh discloses the support layer 13 comprises an adhesive protection tape applied to the under-fill layer 18 (see col. 3 lines 1-11; Figs. 1h and 2n).

With respect to Claims 6, 17, and 29, Saitoh discloses the under-fill layer 18 being a thickness beyond a height thickness of the bump-bodies 17 when incorporate

with the under-fill layer 30 taught by Grigg, would provide additional under-fill material to under-fill structures other than the bumps 18 during any mounting/under-fill process.

With respect to Claims 7-9, 18-20, 30-32, Grigg discloses the under-fill layer 30 comprise a thermoplastic polymer material (see page 6, paragraph 57).

With respect to Claims 10, 21, and 33, Grigg discloses the under-fill layer 30 comprising an opaque material to provide at least one of UV light and radiation protection to a surface of the bumped-die, since a UV sensitive tape is used in the process of thinning the wafer allowing for a loss in the adhesive properties of the tape to occur during the curing by UV radiation (see page 8, paragraph 65).

With respect to Claims 14 and 26, Grigg discloses providing a secondary underfill layer to under-fill 30 to structures other than the bumps as encountered during any mounting process (see page 9, paragraph 76).

With respect to Claims 22 and 34, Grigg discloses the arrangement, which is a flip-chip back-grind/mounting arrangement (see page 8, paragraphs 70-72; Fig. 6).

The prior art made of record and not relied upon is cited primarily to show the product and device of the instant invention.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

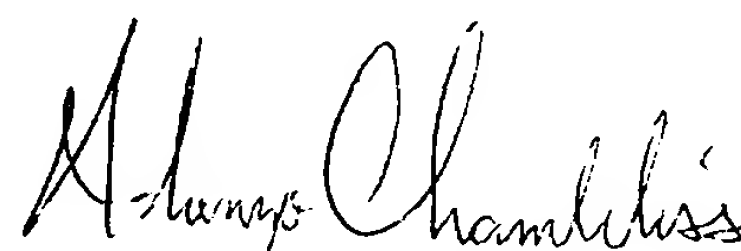
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

Art Unit: 2827

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-7956

AC/July 31, 2003

A handwritten signature in black ink, appearing to read "Alonzo Chambliss". The signature is fluid and cursive, with the first name "Alonzo" and last name "Chambliss" clearly distinguishable.

Alonzo Chambliss
Patent Examiner
Art Unit 2827